A search for exoplanets and close stellar/substellar companions in the local halo population for K2 campaigns 6-7

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We propose to expand the scope of the original Kepler mission by conducting a systematic search for exoplanets orbiting the very old stars of the Galactic halo, a population of stars that was not targeted to any significant degree in the original Kepler mission. Following the recent discovery of exoplanets orbiting Kapteyn's star, a known local halo M subdwarf, and the determination of a very old age (~10Gyr) for the exoplanet bearing star Kepler-10, it is now suspected that stars of the Galactic halo population also harbor exoplanets in significant numbers. However, very little is know about the prevalence and properties of exoplanets orbiting old metal-poor stars because this population has been largely overlooked by most exoplanet surveys. However, our astrometric and photometric analysis of the fields to be observed in campaigns 6-7 of the Kepler K2 mission identifies 2,709 high-velocity subdwarfs that are unambiguous members of the local Galactic halo. We propose to monitor these halo stars with Kepler, to identify and characterize the first generation of exoplanets in our Galaxy. Light curves of the targeted halo stars will be searched for eclipses or transits, following the methodologies developed in the first Kepler mission. Candidates will be targeted for ground-based, follow-up observations to confirm the existence of the transit, and determine if it is from a planet of from a stellar companion. The detection of eclipsing stellar companions would also be of high interest for stellar astrophysics, as it would provide natural calibrators of the mass-radius relationship; while this relationship is critical to constrain models of stellar structure, such calibrators currently do not exist for low-mass, metal-poor stars. Relevance: this program will directly expand on the original goal of Kepler to find exoplanets orbiting main sequence stars in the Galactic disk. The data collected on local Galactic halo stars will be complement existing result from the Kepler mission by providing statistics and/or properties of exoplanets orbiting old, metal-poor stars.